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## Excursion 7: Loch Ranza, North Newton and Cock of Arran

((Figure 13), localities 1 to 17)

The objects of this excursion are:

1. To continue the examination of the Dalradian schists, this time on the north margin of the north Arran granite mass;
2. To examine the classic unconformity on the shore at North Newton;
3. To study the Permian sandstones and breccias at the Cock of Arran and the land-slipped masses at An Scriodan.

1. [NR 9386 5059] Good exposures of dark-grey gritty schists, dipping northwards at steep angles (up to 50°) can be seen at this locality. Note that in passing along the shore towards locality 2 the northerly dip continues for a short distance while the schists become finer in grain and show much small-scale folding and contortion. The axis of the Catacol Synform is then crossed and the inclination of the schists is now in a generally southeasterly direction.

2. [NR 9331 5116] Here the steep southeasterly inclination is well seen in massive, greenish-grey, gritty schists with some darker slaty bands, all much folded. The rock-types closely resemble those exposed on the south shore of the loch near the pier. Boulders of a pale-grey sandstone, probably Carboniferous, are scattered along the shore towards Newton Point. Cowie (1905, pp. 157–158) has also recorded the occurrence at this locality of a "shoal" or band of rock fragments including types similar to those in the "cairn" at Catacol, but without any of the red shaly crinoidal limestone obtained at the latter (see Excursion 8, locality 5a).

3. [NR 9308 5152] At Newton Point some good examples of graded bedding can be studied in coarse or gritty beds, inclined to the south-southeast at angles of 30° to 40°. These are followed to the north by slaty micaceous schists, generally greenish or greenish-grey in colour.

4. [NR 9340 5195] Some 500 m northeast of the point, this is the locality of the well-known unconformity recognised by James Hutton as long ago as 1787. The section extends from the mouth of a little stream, the Allt Beithe, southwards along the coast for some 334m. It shows reddish and yellowish sandstones associated with some bands of pale-coloured, sometimes nodular, cornstone resting with marked discordance upon the schists. These strata were at one time referred to the New Red Sandstone, but later assigned to the Calciferous Sandstone Series, the lowest subdivision of the Carboniferous succession (Gunn 1903, p. 52; Tyrrell 1928, p. 47). The lithological nature of the beds, however, suggests that they may be more fittingly placed in the upper part of the Upper Old Red Sandstone. Note that at the south end of the exposure they dip north-northwest at an angle of about 30°, while the underlying schists are inclined to the south-southwest at angles between 40° and 50°. The schists must have been nearly vertical at the time of deposition of the sandstones and cornstones.

The recognition of the North Newton unconformity provides a striking example of Hutton's genius and insight. It was described by him in Volume 1 of his *Theory of the Earth* (1795, p. 429) and additional details are contained in Volume 3 (published in 1899, pp. 235–236). The following quotation is taken from the latter: "Here the first thing that occurs is the immediate junction of the inclined strata of schistus and the other strata, which here appear to be a composition of sandstone and limestone; these strata are equally inclined with the schistus, but in the opposite direction. These two different kinds of stratified bodies rise to meet each other; they are somewhat confused at the immediate junction, but some of the sandstone or calcareous strata overlap the ends of the alpine schistus." Other unconformities recognised by Hutton in Scotland are those in the River Jed, near Jedburgh. and at Siccar Point on the Berwickshire coast. Such examples of discordance in the geological succession were to him convincing evidence of cycles of change in the operations of nature, proofs of a "succession of worlds" following one another throughout geological time.

For an account of Hutton's life and work reference should be made to Volume 63, part 4, of the *Transactions of the Royal Society of Edinburgh* published in 1950 in commemoration of the 150th anniversary of his death.

5. [NR 9380 5225] Farther northeast along the coast towards the headland known as Rudha Creagan Dubh the principal rock-types are coarse and sometimes pebbly schists with prevailing southeasterly dips. The graded bedding seen on many of the rock faces shows, however, that the succession is inverted. A few northwesterly dykes are present.

6–7. [NR 9432 5229], [NR 9450 5180] Near locality 6 the schists end against a fault which brings on to the east strata belonging to the Carboniferous System. These Carboniferous rocks occur in a wedge-shaped strip, which extends up the Allt Mòr burn for about 1 km from the shore. The wedge is about 200m wide on the coast but narrows when followed inland. Its eastern boundary is formed by another fault which brings on in turn Permian sandstones and breccias. The Carboniferous rocks exposed at intervals along the lower part of the burn are in the main white sandstones, but include also shales and, at one point, a reddish limestone which has yielded crinoid fragments and ribbed brachiopods (*Productus* etc.). This limestone is seen at locality 7, on the right bank of the burn. On the left bank, some 460m above the mouth, there is a good example of fault-breccia.

Near the coast the Allt Mòr has formed a picturesque hollow, known as the Fairy Dell, cut in the relatively soft Carboniferous rocks and containing the remains of old dwellings.

8. [NR 9454 5232] To the east of the fault bounding the Carboniferous rocks the shore is occupied for some distance by Permian sandstones and conglomerates. Note that the generally north-northwesterly dip of these is approximately the same as the angle of slope of the hillside above. The succession here consists of massive beds of bright red sandstone, cross-bedded and containing intercalations of conglomerate which become more numerous in the upper part. The sandstones and conglomerates closely resemble the Brodick Beds, with which they may be equated. The predominating pebbles in the conglomerates are schists of various types, quartzites and vein quartz.

9. [NR 9509 5235] This is the well-known land-slipped area of An Scriodan. It is made up of fallen or slipped masses of Permian sandstones and conglomerates which have covered the raised beach platform for a distance of some 640 m. These falls of rock, which are associated with deep rents and gashes in the hillside above, are said to have taken place over 200 years ago. Care should be taken in negotiating this part of the coast.

10. [NR 9579 5213] The name Cock of Arran is given to a large block of sandstone, some 6m in length and 3 to 3.5m in height, resting on the beach. Its upper part has been broken off, but originally it showed, when seen from the sea, a rather fanciful resemblance to a crowing cock. It lies about 27 m north-northwest of a spring near which some remains of old dwellings can be seen. Near the Cock itself there are a few dykes cutting the Permian: one of these, 1.2m wide and running in a northeast-southwest direction, projects above the surface for most of its exposed course.

11–12. [NR 9656 5164], [NR 9656 5164] These localities are included in the excursion route to allow the visitor an opportunity to examine the contrasted types of sedimentary rocks encountered in crossing the Permian—Carboniferous boundary and of comparing these with the boundary succession of the same sequences at Corrie (Excursion 4, localities 11 and 12). Towards the base of the Permian occur a number of conglomerate bands, two of which include pebbles of Carboniferous limestone, first discovered by Thomson and Wunsch in 1874 (Thomson and Wunsch 1877; Thomson 1897). The fossils obtained from these comprise corals, brachiopods, gastropods and crinoid columnals. The strata following the Permian to the southeast are assigned to the Coal Measures. Gunn records the occurrence of plant remains (referred to *Calamites*, *Cordaites*, *Mariopteris*, *Neuropteris* and *Sphenophyllum*) in beds approximately 18m and 66m southeast of the boundary, and estimated the thickness of the Coal Measures here as about 76m. Leitch (1942, p. 149) gave a detailed section of the succession, with a thickness of 90.7m, the lowest beds being a 3.7 m thick coarse white sandstone with a quartz conglomerate at the base. The varied sedimentation characters of these Coal Measures strata should be noted, characters which point to deposition under deltaic conditions. They differ from those on the Corrie shore in the prevalence of disturbed sandstones in which the bedding is often markedly twisted, contorted and overfolded, so much so as to suggest the formation of a sedimentary flow-breccia following deposition on a slope. Irregular bases to the different beds, minor unconformities and rapid lateral changes in facies are also common phenomena. These strata differ from the Corrie beds again in the general absence of bedded mudstones. Only one "mussel" has been recorded, a form which, according to Leitch, indicates a horizon low in the *modiolaris* zone or possibly in the *ovalis* zone.

If time permits the excursion may be extended about 1 km to the southeast along the coast to look for the giant myriapod trail preserved in a sandstone bed in the Limestone Coal Group near Laggan (Briggs, Rolfe and Brannan 1979). A replica of the trail, along with a reconstruction of the 1m long millipede-like *Arthropleura*, which is thought to have made it, can be seen in the Arran Nature Centre at Brodick. The original trail, over 6m long and 36cm wide, runs east-west across the surface of a sandstone bed exposed in the old quarry above the remains of the salt-pans harbour northwest of Laggan (grid ref. NR 972 511). **On no account should any attempt be made to collect material here as hammering would only lead to the destruction of this remarkable trace fossil.**

On the return journey to Loch Ranza follow the old track which runs from Cock Farm towards locality 13, noting that it crosses an important line of faulting which separates the Carboniferous sediments from the Dalradian schists.

13. [NR 9626 5097] Near this locality there are scattered outcrops of pebbly grits inclined to the south-southeast at angles of 30° to 35°. Cross the hillside to locality 14. Between these localities the grits become less coarse and show a transitional junction with the Loch Ranza slate group. A similar interbedded junction occurs between localities 14 and 15. The exposures seen at localities 13 and 15 fall into subdivision A of (Figure 4) (p. 23).

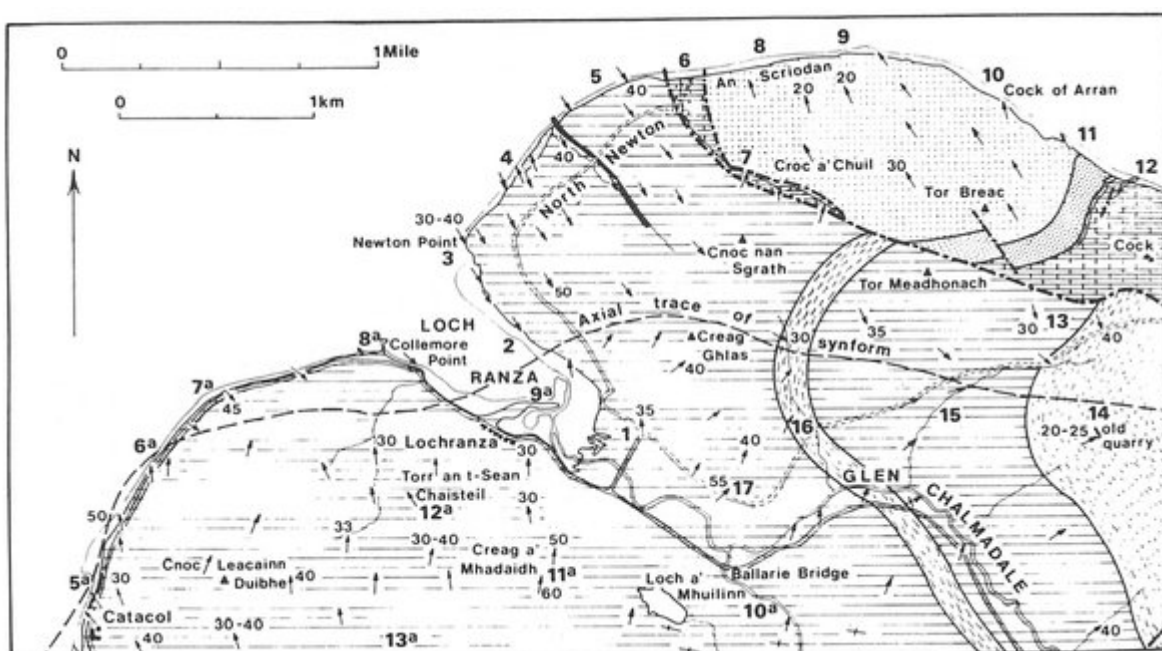
14. [NR 9631 5036] Here there are two old quarries in beds belonging to the Loch Ranza slate group. Note that the inclination is now east-northeastwards at about 25°. This change in direction of dip, seen between locality 13, and localities 14 and 15, is due to the influence of the Catacol Synform. The rocks exposed in the old quarries are thin-bedded, mainly fine-grained slaty beds showing colour banding from pale greenish-grey to dark-grey. Some bands, however, are rough and gritty. The slates were worked on a small scale towards the end of the eighteenth century for local use at North Newton and Loch Ranza.

15. [NR 9552 5059] Examine sections of the Allt Chailean and beside the track showing strongly cleaved schistose grits inclined generally at 16° to 20° in an east-northeasterly direction.

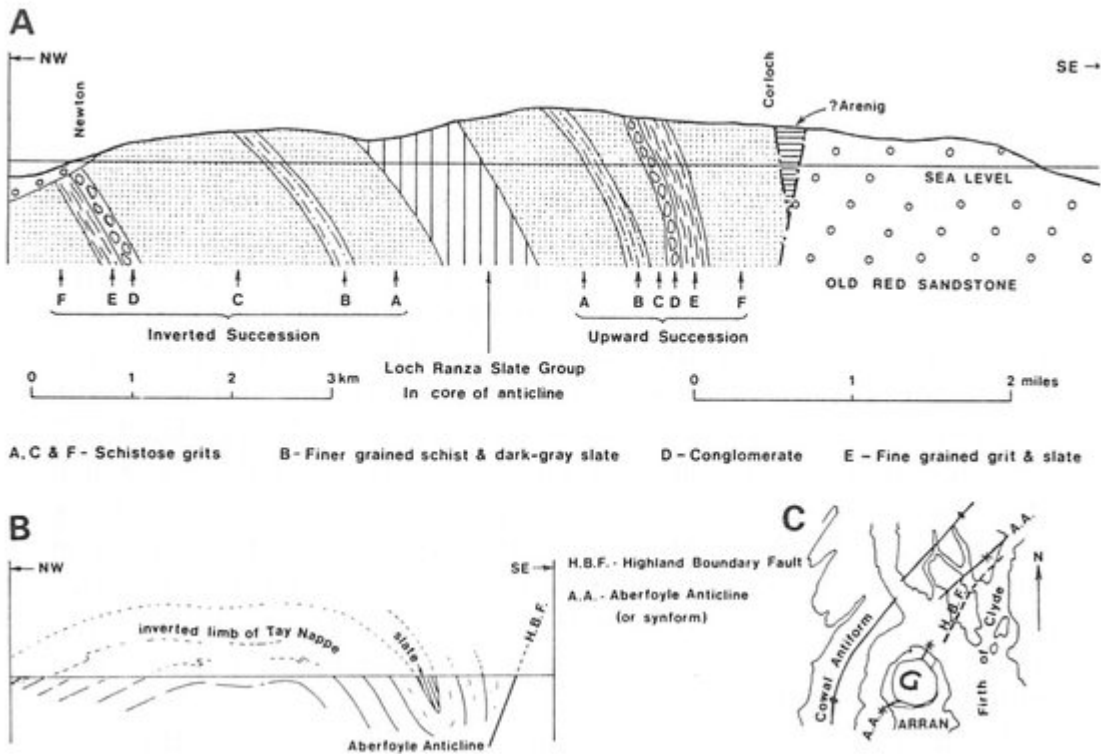
16. [NR 9479 5048] The rocks at localities 16 and 17 fall into subdivisions B and C respectively of the inverted succession shown in (Figure 4) (p. 23). At locality 16 the schists show greenish-grey grits with intercalated slaty bands inclined to the northeast. Good sections are available in the little burn joining Glen Chalmadale from the north, 650m northeast of Ballarie Bridge, as well as in the main stream itself.

17. [NR 9455 5014] There are a number of exposures here alongside and above the old track showing banded greenish-grey and grey, gritty and often coarse schists, inclined to the northeast at generally steep angles, up to 60°.

## References



(Figure 13) Geological sketch-map of the Loch Ranza–Cock of Arran area to illustrate Excursions 8 and 9. For key see Figure 5.



(Figure 4) A, Cross section of Dalradian of North Arran from Newton to Corloch. B. Structural model of the Tay Nappe according to Shackleton (1958). Note the position of the slate at the core of the Aberfoyle Anticline corresponding with the Loch Ranza Slate Group in section A. Length of section B is about 30km. C. Major structures in the Clyde Area. Note how the Aberfoyle Anticline has been distorted by the intrusion of the granite (G).